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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,177	09/27/2004	Akinori Koukitsu	121213	5228

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1722

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/509,177

Applicant(s)

KOUKITSU ET AL.

Examiner

Matthew J. Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 7-11 and 14-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Shibata et al (EP 1184488 A2) from IDS.

Shibata et al discloses an apparatus for hydride vapor phase epitaxy including a first zone 25 heated by heaters 23 and a second zone 26 heated by heaters 24 (Abstract, Fig 1; [0028]-[0038]). Shibata et al also discloses the first zone is heated to up to 900 °C and the second zone is heated up to 1000 °C ([0038]). Shibata et al discloses an inner reactor 31 is made of a quartz material ([0046] and Fig 4), this reads on applicant's a single wall reaction chamber made only of quartz because the inner reactor is made of quartz.

Referring to the limitation requiring the temperature of the first zone is maintained at 700 °C or below and the second zone is maintained at a temperature of 700-1300 °C, this limitation is viewed as intended use and a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The apparatus taught by Shibata et al is capable of performing the claimed intended use because Shibata et al discloses two heaters for maintaining two zones of temperature in a HVPE apparatus.

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Referring to claims 8, 14, and 15, Shibata et al discloses a boat 17 for holding a metallic material ([0030] and Fig 1). The boat taught by Shibata is capable of holding a solid mixture of Al. Shibata et al also discloses a gas supplying means for supplying HCl, hydrogen and ammonia; a susceptor 13 for holding a substrate 12.

Referring to claims 9, the limitation merely further limits the apparatus by claiming an intended use. a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The apparatus taught by Shibata et al is capable of performing the claimed intended use.

Referring to claims 10, Shibata et al discloses the reactor is made of quartz ([0040]), a first heating means 23, a second heating means 24. The limitation of producing a halogenated produced in a first reaction zone is carried by the flow of the gas introduced into the first reaction zone to the second reaction zone, is viewed an intended use limitation. Shibata et al is capable of performing the claimed intended use, thus meets the claimed limitation.

Referring to claim 11, 16, 17, Shibata et al discloses supplying HCl and H₂. The supplying of particular gases is merely intended use. Shibata et al gas supplying mechanism is capable of supplying any gas, thus meets the limitation.

3. Claims 7-11 and 14-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Hong et al (US 6,177,292).

Hong et al discloses a HVPE apparatus comprising a single walled quartz reaction chamber 14 comprising a 3 stage electric furnaces 13, 13' and 13'' (col 4, ln 1-30 and Fig 2). The electric furnaces 13, 13' and 13'' are capable of providing a first reaction zone at a temperature of 700°C or below and a second reaction zone maintained at a temperature of 700-1300°C, as evidenced by the temperatures depicted in Figure 2. The actual temperature of the zones are merely intended use. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Referring to claim 8, Hong et al discloses a support means 15 for supporting a solid, a substrate support 16 and a plurality of tubes for introducing gaseous reactants (Fig 2), that include HCl, NH₃ and N₂, this reads on applicant's introduction means.

Referring to claim 9 and 14, the limitation merely further limits the apparatus by claiming an intended use. a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The apparatus taught by Hong et al is capable of performing the claimed intended use.

Referring to claim 10 and 15, Hong et al discloses the reactor is made of quartz (col 4, ln 1-25), a first heating means 13', and a second heating means 13''. The limitation of producing a halogenated produced in a first reaction zone is carried by the flow of the gas introduced into the

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first reaction zone to the second reaction zone, is viewed an intended use limitation. Hong et al is capable of performing the claimed intended use, thus meets the claimed limitation.

Referring to claim 11, 16, 17, Hong et al discloses supplying HCl and N₂. The supplying of particular gases is merely intended use. Hong et al's gas supplying mechanism is capable of supplying any gas, thus meets the limitation.

Referring to claims 7-11 and 14-17, applicant is merely limiting the conventionally known HVPE apparatus for a AlN deposition. Hong et al does not teach AlN deposition, however the apparatus is capable of forming AlN depending on the reactants used.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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5. Claims 1, 3 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikolaev et al (US 6,218,269).

In a method of forming III-V compounds, note entire reference, Nikolaev et al teaches reacting Al metal with HCl at a temperature of 350-800 °C, this clearly suggests applicant's solid Al because Al metal is solid at temperature below 660 °C, to produce a halogenated product of Al, aluminum trichloride (col 7, ln 50 to col 8, ln 20). Overlapping ranges are held to be prima facie obvious (MPEP 2144.05). Nikolaev et al also teaches forming a III-V compound by reacting aluminum trichloride with ammonia to form AlGaN (col 8, ln 1-25).

Referring to claim 3, Nikolaev et al teaches HCl.

Referring to claim 18, Nikolaev et al teaches reacting with ammonia.

6. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikolaev et al (US 6,218,269) as applied to claims 1 and 3 above, and further in view of Shibata et al (EP 184488 A2) and Vaudo et al (US 6,533,874).

Nikolaev et al teaches all of the limitations of claim 4, as discussed previously, except at least one of the amount of the halogenated hydrogen used; the amount of a carrier gas for the halogenated hydrogen; and the amount of the group V element containing gas is varied to deposit a III-V group compound semiconductors having different composition. Nikolaev et al teaches AlGaN layers forming pn junctions may have different AlN concentrations for different layers (col 7, ln 10-45).

In a method of HVPE, note entire reference, Shibata et al teaches HCl is introduced with H₂ carrier gas and reacted with metallic aluminum to form AlCl gas ([0034]).

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It would have been obvious to a person of ordinary skill in the art at the time invention Nikolaev et al by using a carrier gas for HCl, as taught by Shibata et al, because carrier gases are known in the art to provide a smooth of reaction gases into the deposition chamber, as evidenced by Kang et al (US 6,197,683) in column 6, lines 15-25.

The combination of Nikolaev et al and Shibata et al does not teach the amount of a carrier gas for the halogenated hydrogen is varied to deposit a III-V group compound semiconductors having different composition.

In a method of HVPE, note entire reference, Vaudo et al teaches the composition of (Ga,Al,In)N is controlled by the flow of HCl over each metal as well as by the substrate temperature and by the temperature of each metal (col 11, ln 10-60), this clearly suggests varying the amount and the amount of carrier gas for the halogenated hydrogen gas because the flow of HCl is dependant on the flow carrier gas.

It would have been obvious to a person of ordinary skill in the art at the time invention to modify Nikolaev et al by varying the HCl amount or amount of carrier gas, as suggested by Vaudo et al, to produce useful graded layers or pn junctions.

Referring to claim 6, the combination of Nikolaev et al, Shibata et al, and Vaudo et al teach HCl and H₂ ('488 Fig 4).

7. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikolaev et al (US 6,218,269) as applied to claims 1 and 3 above, and further in view of Solomon et al (WO 00/68470 A1) from IDS.

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Nikolaev et al teaches all of the limitations of claim 2, as discussed previously, except reacting a solid mixture of group III metals including Al.

In a HVPE method, note entire reference, Solomon et al teaches reacting a group III metal with HCl, where the Group III metal is Ga, In, or Al or alloys thereof (pg 11, ln 1-25).

It would have been obvious to a person of ordinary skill in the art at the time invention to modify Nikolaev et al by using a mixture of Group III metals, which include Al, as taught by Solomon et al because a combination of known material suitable of its intended purpose is held to be obvious (MPEP 2144.07) and because an alloy of Group III metals can produce a ternary compound with a single source.

Referring to claim 12, Nikolaev et al teaches HCl.

8. Claims 5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikolaev et al (US 6,218,269) and Solomon et al (WO 00/68470 A1) from IDS, as applied to claims 2 and 12 above, and further in view of Shibata et al (EP 184488 A2) from IDS and Vaudo et al (US 6,533,874).

The combination of Nikolaev et al and Solomon et al teaches all of the limitations of claim 5, as discussed previously, except at least one of the amount of the halogenated hydrogen used; the amount of a carrier gas for the halogenated hydrogen; and the amount of the group V element containing gas is varied to deposit a III-V group compound semiconductors having different composition. Nikolaev et al teaches AlGa_N layers forming pn junctions may have different AlN concentrations for different layers (col 7, ln 10-45).

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In a method of HVPE, note entire reference, Shibata et al teaches HCl is introduced with H₂ carrier gas and reacted with metallic aluminum to form AlCl gas ([0034]).

It would have been obvious to a person of ordinary skill in the art at the time invention to modify the combination of Nikolaev et al and Solomon et al by using a carrier gas for HCl, as taught by Shibata et al, because carrier gases are known in the art to provide a smooth of reaction gases into the deposition chamber, as evidenced by Kang et al (US 6,197,683) in column 6, lines 15-25.

The combination of Nikolaev et al, Solomon et al and Shibata et al does not teach the amount of a carrier gas for the halogenated hydrogen is varied to deposit a III-V group compound semiconductors having different composition.

In a method of HVPE, note entire reference, Vaudo et al teaches the composition of (Ga,Al,In)N is controlled by the flow of HCl over each metal as well as by the substrate temperature and by the temperature of each metal (col 11, ln 10-60), this clearly suggests varying the amount and the amount of carrier gas for the halogenated hydrogen gas because the flow of HCl is dependant on the flow carrier gas.

It would have been obvious to a person of ordinary skill in the art at the time invention to modify the combination of Nikolaev et al, Solomon et al and Shibata et al by varying the HCl amount or amount of carrier gas, as suggested by Vaudo et al, to produce useful graded layers or pn junctions.

Referring to claim 13, the combination of Nikolaev et al, Solomon et al, Shibata et al, and Vaudo et al teach HCl and H₂ ('488 Fig 4).

Response to Arguments

9. Applicant's arguments with respect to claims 7-11 and 14-17 have been considered but are moot in view of the new ground(s) of rejection.

10. Applicant's arguments filed 2/14/2007 have been fully considered but they are not persuasive.

Applicant's argument that Shibata et al does not teach a single wall reaction chamber made only of quartz is noted but is not found persuasive. Applicant alleges that Shibata discloses an inner quartz reactor and an outer quartz reactor, thus does not teach a single wall reactor comprises of quartz. However, the inner quartz reactor 31 depicted in Figure 4 of Shibata et al is a single walled reactor comprised only of quartz. The fact that there is second reactor surrounding the first reactor does not distinguish Shibata et al from the instantly claimed invention. Applicant's invention merely requires a single walled reactor made of quartz which is disclosed by Shibata et al.

Applicant's argument that Nikolaev et al does not teach a deposition temperature of 1200-1300°C is noted but is not found persuasive. Applicant alleges that Nikolaev et al merely teaches a temperature range of 900-1200°C. However, overlapping ranges are held to be *prima facie* obvious, absent evidence of unexpected results (MPEP 2144.05). Nikolaev et al's temperature range overlaps the claimed range and applicant has not provided any evidence of unexpected results to rebut the Examiner's *prima facie* case of obviousness. Applicant's also alleges that Nikolaev et al teaches a growth temperature of 800-1100°C. This argument is not persuasive because applicant is merely citing background information of Nikolaev which relates

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to a MOCVD process, not the HVPE process taught by Nikolaev et al. Nikolaev et al teaches a temperature range of 900-1200°C for a HVPE process, note the Abstract.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


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MJS
April 13, 2007